Received: 14 July. 2014 **Accepted: 23 May. 2015**

Oral health and school performance in elementary students: A cross-sectional study in a group of Iranian students, Tehran, Iran

Seyed Jalal Pourhashemi DDS, MS[1], Mehrsa Paryab DDS, MS[2], Kiarash Kheirandish DDS[3], Mohammad Javad Kharazi-Fard DDS, PhD[4]

Original Article

Abstract

BACKGROUND AND AIM: Dental health plays a key role in the overall health status and quality of life in children. Consequences of dental diseases in children may result in impairments of daily life activities. The aim of this study was to assess the relationships between dental health and educational performances in elementary students.

METHODS: A total of 300 elementary students from the second to fifth grades in ninth district of Tehran, Iran, were included in this study according to inclusion criteria. Questionnaire gathering information about the students' demographic background, medical and dental histories was sent to their parents. The students' academic performances were assessed based on the school absence in relation to dental problems, their school grades and doing homework. Oral health status was assessed based on the World Health Organization (WHO) standards using caries and oral hygiene indices. Data were analyzed by the Pearson's correlation and linear regression analysis. All statistical levels were made at 0.05 for the Pearson's correlation and 0.1 for linear regression analysis.

RESULTS: School test grades and school absences due to dental problems were statistically associated with oral hygiene index (OHI) of the students (P = 0.010 and P = 0.040, respectively). The indices of dental caries in primary or permanent teeth were not significantly associated with school performances (P ≥ 0.140). The analysis revealed that the factors i.e., housing status and living with the parents are statistically associated with the oral health indices (P = 0.050 and P =0.080; respectively) and on the other hand with school performances (P = 0.020 and P = 0.010; respectively).

CONCLUSION: Children with poorer oral health status were more likely to perform poorly in school. Socio-economic status of the students affects negatively both school performances and oral health care. Also, oral health status and dental problems may cause deterioration in educational conditions.

KEYWORDS: Students, Oral Health, Dental Caries, School, Performance

Citation: Pourhashemi SJ, Paryab M, Kheirandish K, Kharazi-Fard MJ. **Oral health and school performance in elementary students: A cross-sectional study in a group of Iranian students, Tehran, Iran.** J Oral Health Oral Epidemiol 2015; 4(2)

Oral health is an important component of general health.[1] It has been well established that oral health may affect several domains of child growth,[2] development and socio-physical functions such as feeding, and breathing, speaking, smiling and social adaptation.[3] Dental caries may result in pain, infections and tooth loss.[4] These consequences are associated with disturbed nutrition and poor growth. It has also been found that dental problems are associated considerable decrease in student's presence in school and poor social contact with their friends.[5-13] Parents may also miss days from work because of their children's dental

1- Associate Professor, Department of Pediatrics Dentistry, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran
2- Assistant Professor, Department of Pediatrics Dentistry, School of Dentistry, International Campus, Tehran University of Medical Sciences, Tehran, Iran
3- Private Practice, International Campus, Tehran University of Medical Sciences, Tehran, Iran
4- Assistant Professor, Epidemiologist, Dental Research Center, Tehran University of Medical Sciences, Tehran, Iran
Correspondence to: Mehrsa Paryab, DDS, MS
Email: drmparyab@yahoo.com

problems.[12] The impact of oral health on the child's life is so great that educational achievement measures such as school performance can be included as a good proxy indicator of oral health.[5,7]

Evidence suggests that the people of the lower socioeconomic status may have more children and a second job and no time for special planning of dental care. This issue is of great importance for children under 12 years who need direct parental supervision on dental care and dental office visits[5]. Some more investigations are necessary to assess this hypothesis.

In Iran, a high percentage of children experience dental problems,[14] but limited data are available on dentally related school absence and performances. The purpose of this study was to assess the association of dental problems on the school performance of elementary students by consideration of their socio-demographic characteristics and access to care determinants. The result of this study may improve the parental attitude toward the oral health importance in relation to their child's school performance.

Methods

This cross sectional study was approved by the Ethics Committee of Tehran University of Medical Sciences, Iran, and involved five different boys' elementary schools in ninth district of Tehran during 2013. The schools included in this study were selected through a multistage cluster stratified random sampling from a low socio-economic district and not covered by any school-based program of preventive dentistry. Each child was given a code to avoid bias.

Based on the results of the pilot study on 50 subjects and using the "sample size determination for comparing two proportions," 500 students from the second to fifth grades were invited to participate in our study. A consent form and a two-section questionnaire comprised of 25 questions were sent to their parents.

The first section of the questionnaire gathered information about demographic background and medical and dental history of the child and family. The second section included three questions about the school absences of the students and their performance in doing homework in relation to dental problems or treatment. The validity of the questionnaire was assessed by an expert committee consisting of one specialist in dental public health and three pediatric dentists and their responses were used to improve the questionnaire's accuracy. The test-retest repeatability (a 2 week interval) of the questionnaire was measured by kappa coefficient and our result showed an excellent agreement between the test-retest responses and a weighted kappa of 0.93.

The questionnaire with two or more unanswered questions (n = 40) or students with systemic, psychological or developmental problems (n = 60) and those with uncompleted consent form (n = 100) were excluded from this study. Of those invited, 300 students with informed parental consent were included in oral examination. The examiner was prepared for detection of caries and indexing of oral hygiene [decayed, missing, or filled teeth (DMFT), dmft, oral hygiene index (OHI)] according to world health organization (WHO) diagnostic criteria for epidemiological surveys by an expert dentist.[15]

Dental examinations were performed in the school's medical room using flat dental mirrors under daylight supported by a headlight. Teeth were cleaned from food accumulation using necessary gauze. The indices of caries and oral hygiene for each child were recorded in a dental chart. Data of the students' school grades included the summated scores of mathematics, bio-sciences, language and humanitarian arts; which each student obtained.

Data were analyzed using the SPSS (version 16, SPSS Inc., Chicago, IL, USA) by Pearson's correlation and regression analysis.

The P < 0.050 was considered as significant.

Results

A total of 300 students participated in this study. Participants were in the age range of 7-14 years old with a mean ± standard deviation (SD) age of 9.6 ± 1.58 years. The main data obtained from the students' dental history are shown in table 1.

The descriptive statistics for school performances of the students and oral examinations are presented in tables 2 and 3. As shown, 6.33% of children (n = 25) missed at least 1 school day/year for dental problems. Also, 9.7% of children who experienced dental pain and infections in the last year were more likely to have problems in completing their homework. According to the oral examination of students, the mean OHI was 0.83 (SD = 0.058) and ranged from 0-4. Mean DMFT and mean dmft was 1.27 and 3.62, respectively. DMFT ranged from 0-9 and dmft ranged from 0-13.

The results of Pearson's correlation analysis between indicators of oral health and school performances (Table 4) showed that school test grades and school absences because of dental problems were statistically associated with OHI of the students (P < 0.050). No relation was found between the indices of school performances and DMFT or dmft (P > 0.050). Also, the performance of students in completing homework was significantly affected by the school absences because of dental problems or treatments (P < 0.050). The statistical analysis showed that when the school absences because of dental problems increased, the number of days missed for dental treatments increased as well; and the students with dental problems and absences were less likely to do all the required homework.

Table 1. Dental history of the students (n = 300) in the study

Dental history	Percentage
No dental visits	14.0
Only one dental visit	40.0
Last dental visit in more than 2 years ago	23.3
Experience of pain	23.0
Dental appointment due to dental pain or infections	54.3
Irregular tooth brushing	58.3
No fluoride mouthwashes	85.3

Table 2. School performance of the students (n = 300) in the study

Indices of school performance	Students [n (%)]
Number of days of school absences because of dental treatment in the past year	No absence: 278 (92.7) 1-day: 14 (4.7) 2 days or more: 7 (2.3) Unanswered: 1 (0.3)
Number of days of school absences because of dental pain and infections in the past year	No absence: 288 (96.0) 1-day: 8 (2.7) 2 days or more: 4 (1.3)
Difficulty with homework due to dental pain	Yes: 29 (9.7) No: 271 (90.3)

Table 3. The mean caries and oral health indices of the students (n = 300) in the study based on the oral examinations

Oral health indices	Minimum	Maximum	Mean ± SD
DMFT*	0	9	1.27 ± 1.68
dmft**	0	13	3.62 ± 3.05
OHI***	0	4	0.83 ± 0.58

*Total number of permanent carious teeth, filled teeth and extracted teeth due to caries, **Total number of primary carious teeth, filled teeth and extracted teeth due to caries, ***Total sum of calculus and debris indices
OHI: Oral hygiene index; DMFT: Decayed, missing, or filled teeth; SD: Standard deviation

Table 4. The association between indicators of oral health and school performance of the students (n = 300) in the study based on the Pearson's correlation analysis

School performances	Indicators of oral health					
	DMFT*		dmft**		OHI***	
	Pearson's correlations	P	Pearson's correlations	P	Pearson's correlations	P
School test grades	-0.08	0.140	0.010	0.790	-0.14	0.010
Performance in completing homework	-0.01	0.820	0.050	0.330	0.06	0.240
Absences because of dental pain and infections	-0.02	0.670	0.080	0.160	0.11	0.040
Absences because of dental treatment	-0.02	0.640	-0.005	0.930	0.05	0.390

*Total number of permanent carious teeth, filled teeth and extracted teeth due to caries, **Total number of primary carious teeth, filled teeth and extracted teeth due to caries, ***Total sum of calculus and debris indices
OHI: Oral hygiene index; DMFT: Decayed, missing, or filled teeth

Table 5. The association between some environmental factors and oral health indices of the students (n = 300) in the study based on the regression analysis

Environmental factors	Indicators of oral health					
	DMFT*		dmft**		OHI***	
	Beta coefficient	P	Beta coefficient	P	Beta coefficient	P
Order of child in the family	0.08	0.220	0.28	< 0.001	0.06	0.230
Number of children	0.02	0.640	-0.08	0.260	0.01	0.860
Going to the kindergarten	-0.05	0.340	0.09	0.070	-0.05	0.310
Living with parents	-0.03	0.490	0.01	0.900	-0.10	0.080
Frequency of tooth brushing	-0.10	0.070	-0.17	0.003	-0.16	0.004
Using fluoride mouthwashes	0.06	0.230	-0.08	0.140	0.04	0.470
Insurance coverage	0.05	0.310	0.01	0.790	0.01	0.780
Father's age	-0.08	0.290	-0.07	0.330	0.07	0.190
Mother's age	0.19	0.001	-0.19	0.005	0.06	0.260
Father's education	-0.08	0.160	0.01	0.860	-0.08	0.160
Mother's education	-0.02	0.620	0.06	0.290	-0.08	0.150
Housing status	-0.001	0.990	0.15	0.008	0.10	0.050
Number of follow-up dental visits	0.10	0.060	0.04	0.420	0.01	0.850

*Total number of permanent carious teeth, filled teeth and extracted teeth due to caries, **Total number of primary carious teeth, filled teeth and extracted teeth due to caries, ***Total sum of calculus and debris indices
OHI: Oral hygiene index; DMFT: Decayed, missing, or filled teeth

In the assessment of the association between some socio-demographic characteristics and oral health indices, the analysis of Pearson's correlation revealed that the students with infrequent tooth brushing, poorer socio-economic status and those who did not live with their parents had higher OHI (P = 0.040, P = 0.050 and P = 0.080; respectively). There was no statistically significant association between OHI and other factors (P > 0.100) (Table 5).

The regression analysis of the effect of socio-demographic characteristics on school performance indices showed a significant statistical association between school performance of the students and their educational ranking, living with their parents, parental education and housing status; as students who lived with their parents and students from the families with higher socio-economic status and educational levels obtained higher test grades (P = 0.010, P = 0.020 and P = 0.040; respectively).

Discussion

Several findings highlight the importance of oral health in childhood not only for improving dental functioning in adulthood but also for the likely extended benefits for child's educational achievements and psychosocial development.

Dental caries is a common chronic

childhood disease just like asthma, diabetes and obesity.[4] Studies have shown that chronic diseases may negatively affect the children's socio-cognitive development such as their school performance. This can be due to an increase in school absence.[8,16] Thus, it has been determined that one of the most important goals for healthy people in 2020 is to reduce children's dental problems and increase their access to preventive dental care through effective policies and public health interventions.[11]

This study was designed to assess the school performance of the elementary-aged boys in relation to caries and oral hygiene indices. The results showed that most of the students with poor status of oral hygiene have more poor school performances. Some preceding investigations revealed that poor oral health alone is not a significant affective factor; likewise, general health and social status have higher predicting values.[8,9] The reason could be the different socio-economic status.

On the contrary, in several studies from various countries, the oral health status has been found as an important factor which may be associated with the students' performances.[6,7,12,13] In a study by Blumenshine et al.[8] the parents of students that reported an overall poor oral health of their children also explained more complicated school performance. Garg et al.[13] and Muirhead and Marcenes[7] showed that dental caries can be an affective factor on the student's school scores. In findings by Weissenbach et al.[6] several oral health indices including DMFT, dmft and OHI had a statistically significant relationship with school performance.

In the present study, OHI was found to be statistically associated with the number of days missed from school and student's test grades. It is consistent with the results obtained by Seirawan et al.[12] They also found that dental problems are associated with the student's school absences and school grades, but the number of dental caries was not too important. These two studies were conducted in students from lower socio-demographic families.

In an analysis on the association between the oral health indices and some socio-demographic characteristics, the frequency of tooth brushing and dental visits and socio-economic level of the family like the housing status were the main factors which had statistically significant relationship with oral health. It appears that the children from families with lower socio-economic status may have less dental home care like tooth brushing and higher levels of OHI. They also have less school attendance and school grades. Consequently, dental problems and more school absences result in the student being less likely to do homework as required.

The data from questionnaires showed that a large percentage of students did not have regular dental visits in the last year, and about 25.0% of them did not have any dental appointment in the past 2 years. The moderate status of OHI (mean = 0.83) and high rate for the need of emergency treatment confirm these issues.

The statistical analysis showed that when school absences due to dental problems increase, the number of days missed for dental treatments are increased as well; it is a fact that in Iran, organized public centers who introduce the free or low-charge dental services are open during school hours. These families usually arrange appointments with these centers. This leads to school absences for dental treatment. These findings are in agreement with studies by Gift et al.[5] Blumenshine et al.[8] and Jackson et al.[10]

However, Weissenbach et al.[6] stated that oral health status are in relation to school performance and social status of parents is not so important. It should be kept in mind that school performances of students are influenced by several socio-demographic and general health factors. In cross-sectional studies, one cannot evaluate the exact interaction of the factors. The results of the current study showed that the

socio-economic status of the students such as housing status of the family and living with both parents had significant effects on their indices of oral health and school performances. Therefore, students with poor socio-economic status will have lower performance in schools and simultaneously have lower oral health. On the other hand, the analysis also revealed that OHI was significantly associated with the school performance. So, dividing the effects of the socio-economic status and the oral health factors on the school performances of the students' needs a longitudinal study.

Another error is unobserved confounding factors that may influence the oral health status and schooling outcomes.[17-24] Lifestyle of the family like nutrition and psychosocial performances are other important confounding factors which were not evaluated. Guarnizo-Herreno and Wehby[11] showed that students with poor oral health had a lower social relationship with their siblings, and they were less happy. Also the psychosocial status of the students can affect oral health care and, on the other hand, their school performances.

The studied subjects were a group of Iranian students from moderate to low socio-economic families. Also, because of some cultural limitations, only boy students were included in the current study. Thus, the results cannot be generalized to other children with different socio-economic conditions or girl students.

Nevertheless, this study provided baseline data in an Iranian population to declare the importance of oral health in relation to the socio-cognitive performance of children and merits special considerations are given to their oral hygiene and dental caries status. It is suggested to design studies to evaluate this issue considering more confounding factors in different samples.

Conclusion

1. Children with poorer oral health status were more likely to experience school absences and perform poorly in school
2. The socio-economic status of the family is an important factor affecting oral health status and school performance.

Conflict of Interests

Authors have no conflict of interest.

Acknowledgments

This study was based on a thesis to the graduate faculty, School of Dentistry, Tehran University of Medical Sciences, in partial fulfilment of the requirements for the doctorate degree. This cross sectional study was approved by the Ethics Committee of Tehran University of Medical Sciences (ethical code: 92/د/130/1916). The authors gratefully acknowledge the very helpful collaboration and cooperation of schools staff.

References

1. Sheiham A. Dental caries affects body weight, growth and quality of life in pre-school children. Br Dent J 2006; 201(10): 625-6.
2. McGrath C, Broder H, Wilson-Genderson M. Assessing the impact of oral health on the life quality of children: implications for research and practice. Community Dent Oral Epidemiol 2004; 32(2): 81-5.
3. Reisine ST. Dental health and public policy: the social impact of dental disease. Am J Public Health 1985; 75(1): 27-30.
4. McDonald RE, Avery DR, Stookey GK. Dental caries in the child and adolescent. In: Dean J, Avery D, .McDonald RE, Editors. McDonald and Avery dentistry for the child and adolescent. 9th ed. New York, NY: Elsevier Health Sciences; 2010. p. 85.
5. Gift HC, Reisine ST, Larach DC. The social impact of dental problems and visits. Am J Public Health 1992; 82(12): 1663-8.
6. Weissenbach M, Chau N, Benamghar L, Lion C, Schwartz F, Vadot J. Oral health in adolescents from a small French town. Community Dent Oral Epidemiol 1995; 23(3): 147-54.
7. Muirhead V, Marcenes W. An ecological study of caries experience, school performance and material deprivation in 5-

year-old state primary school children. Community Dent Oral Epidemiol 2004; 32(4): 265-70.
8. Blumenshine SL, Vann WF, Gizlice Z, Lee JY. Children's school performance: impact of general and oral health. J Public Health Dent 2008; 68(2): 82-7.
9. Pongpichit B, Sheiham A, Pikhart H, Tsakos G. Time absent from school due to dental conditions and dental care in Thai schoolchildren. J Public Health Dent 2008; 68(2): 76-81.
10. Jackson SL, Vann WF, Kotch JB, Pahel BT, Lee JY. Impact of poor oral health on children's school attendance and performance. Am J Public Health 2011; 101(10): 1900-6.
11. Guarnizo-Herreno CC, Wehby GL. Children's dental health, school performance, and psychosocial well-being. J Pediatr 2012; 161(6): 1153-9.
12. Seirawan H, Faust S, Mulligan R. The impact of oral health on the academic performance of disadvantaged children. Am J Public Health 2012; 102(9): 1729-34.
13. Garg N, Anandakrishna L, Chandra P. Is there an association between oral health status and school performance? A Preliminary Study. Int J Clin Pediatr Dent 2012; 5(2): 132-5.
14. Seyedein SM, Zali MR, Golpaigani MV, Yazdani H, Nourhalouchi S. Oral health survey in 12-year-old children in the Islamic Republic of Iran, 1993-1994. East Mediterr Health J 1998; 4: 338-42.
15. World Health Organization. Oral health surveys: basic methods. 4th ed. Geneva, Switzerland: World Health Organization; 1997.
16. Crump C, Rivera D, London R, Landau M, Erlendson B, Rodriguez E. Chronic health conditions and school performance among children and youth. Ann Epidemiol 2013; 23(4): 179-84.
17. Farooq MS, Chaudhry AH, Shafiq M, Berhanu G. Factors affecting students' quality of academic performance: a case of secondary school level. Journal of Quality and Technology Management 2011; 7(2): 1-14.
18. Kunje D, Selemani-Meke E, Ogawa K. An investigation of the relationship between school and pupil characteristics and achievement at the basic education level in Malawi. Journal of International Cooperation in Education 2009; 12(1): 33-49.
19. Yusoff MS, Esa AR, Mat Pa MN, Mey SC, Aziz RA, Abdul Rahim AF. A longitudinal study of relationships between previous academic achievement, emotional intelligence and personality traits with psychological health of medical students during stressful periods. Educ Health (Abingdon) 2013; 26(1): 39-47.
20. Hurt H, Malmud E, Brodsky NL, Giannetta J. Exposure to violence: psychological and academic correlates in child witnesses. Arch Pediatr Adolesc Med 2001; 155(12): 1351-6.
21. Sweeney PC, Nugent Z, Pitts NB. Deprivation and dental caries status of 5-year-old children in Scotland. Community Dent Oral Epidemiol 1999; 27(2): 152-9.
22. Prendergast MJ, Beal JF, Williams SA. The relationship between deprivation, ethnicity and dental health in 5-year-old children in Leeds, UK. Community Dent Health 1997; 14(1): 18-21.
23. Mattila ML, Rautava P, Sillanpää M, Paunio P. Caries in five-year-old children and associations with family-related factors. JDR 2000; 79(3): 875-81.
24. Kinirons M, McCabe M. Familial and maternal factors affecting the dental health and dental attendance of preschool children. Community Dent Health 1995; 12(4): 226-9.